In the Claims

1. (currently amended) A method for identifying a location of an object in a physical scene with a stereo camera comprising:

identifying a virtual surface in the physical scene;

constructing an approximate disparity set for the virtual surface;

acquiring a main and a reference image of the scene with the stereo camera;

warping the reference image according to the disparity set;

subtracting pixels of the warped reference image from corresponding pixels of the main image to determine a depth residual of each pixel;

acquiring a sparse set of point correspondences from a calibration pair of images;

applying a polynomial interpolation to the sparse set of point correspondences to generate a smooth continuous approximate disparity set, wherein a particular disparity, $\mathbf{d}(x, y)$ is approximated by a linear system $\mathbf{d}(x, y) = \Lambda\tilde{\mathbf{x}}(x, y)$, where Λ is an unknown matrix of coefficients, and $\tilde{\mathbf{x}}(x, y)$ is a power expansion of $\mathbf{x} = [x, y]^T$

$$\tilde{\mathbf{x}}(x, y) = \begin{bmatrix} x^2 \\ y^2 \\ xy \\ x \\ y \\ 1 \end{bmatrix}; \text{ and}$$

identifying pixels having a substantially non-zero residual with a surface of the object not coincident with the virtual surface.

2. (original) The method of claim 1 wherein the virtual surface has an associated margin to form a virtual volume near the virtual surface with a thickness equal to the margin.

3. (original) The method of claim 1 wherein the virtual surface is an arbitrary surface defined in a space of the physical scene.

4. (original) The method of claim 1 wherein the virtual surface is partially tangible and partially in a space of the scene.

5. (original) The method of claim 1 further comprising:

setting each depth residual less than a predetermined threshold to zero; and

setting all other depth residuals to one to generate a binary segmentation mask for the object.

6. (original) The method of claim 1 wherein the object is moving, and further comprising:

tracking the moving object in a stereo video of the scene using the binary segmentation mask.

7. (cancelled)

8. (Cancelled)

9. (original) The method of claim 1 wherein the virtual surface is substantially planar and the approximated disparity set is obtained from intrinsic camera parameters of the stereo camera.

10. (original) The method of claim 1 further comprising:

determining a touching of the virtual surface by the object from the depth disparities.

11. (original) The method of claim 1 further comprising:

illuminating the scene and the object with a dynamic projector.

12. (original) The method of claim 11 wherein the illumination includes a high contrast image.

13. (original) The method of claim 2 further comprising:

performing volumetric depth segmentation operations according to virtual volume.

14. (original) The method of claim 1 further comprising:

identifying a first virtual surface in the physical scene;

identifying a second virtual surface in the physical scene offset from the first virtual surface by a constant distance;

analytically constructing an approximate disparity set for the first virtual surface and the second virtual surface;

warping the reference image according to the first disparity set;

warping the reference image according to the second disparity set;

subtracting each pixel of the first warped reference image from a corresponding pixel of the main image to determine a first depth residual of each pixel; and

subtracting each pixel of the second reference image from a corresponding pixel of the main image to determine a second depth residual of each pixel; and

comparing the first and second depth residuals to determine a touching of the virtual surface.

15. (cancelled)

16. (cancelled)

17. (cancelled)

18. (cancelled)

19. (cancelled)

20. (cancelled)